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(56) Documents cited GB 1440081 GB 1328524 GB 1315149 GB 1264894 GB 762983 GB 146335
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(54) Web Formation

(57) Forming a coherent web of fibrous strands by feeding an array of strands, e.g. woollen yarns, 10 side by side into the nip of a pair of rollers 16, 18 one of which 16 has a series of parallel V shaped grooves 20 and applying adhesive to the array, e.g. from a trough 22 and supporting the web 24 so-formed until the adhesive cures or is cured. Compression of the strands in the V shaped grooves 20 prevents or reduces strike-through of the adhesive to the upper face of the web. A second pair of nip rollers 26, 28 may be provided with the roller 26 having grooves aligned with roller 16 to provide a first curing zone 25. If desired a backing sheet 32 from a roll 34 may be fed into the second nip where it will laminate to the web 24. A second curing zone 31 completes the curing and the finished web is wound on to a take-up roller. The web produced is a decorative fabric which may be used for a variety of products, such as lampshades and wall coverings.

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

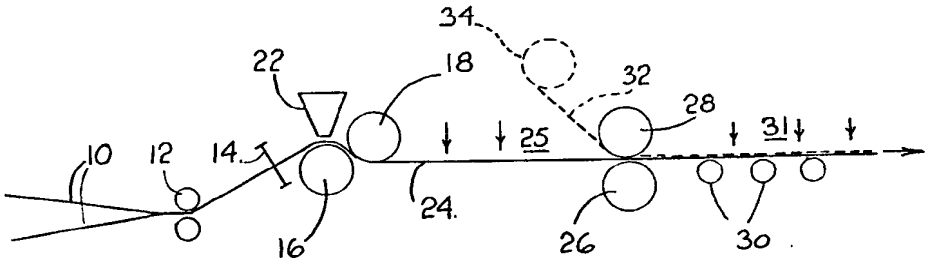

fig. 1.

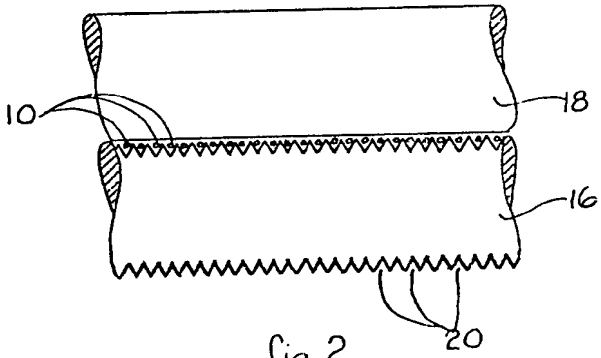

fig. 2.

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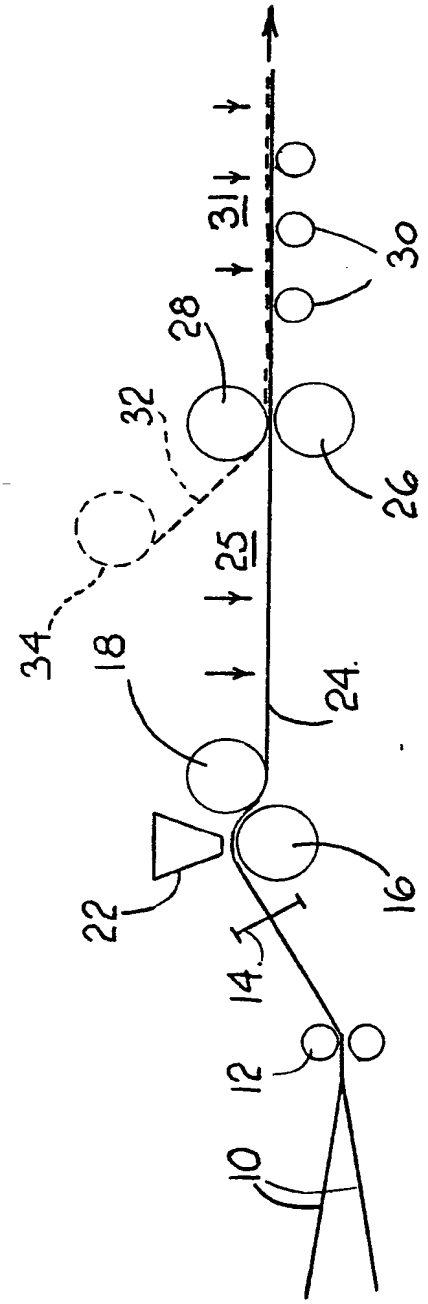

fig. 1.

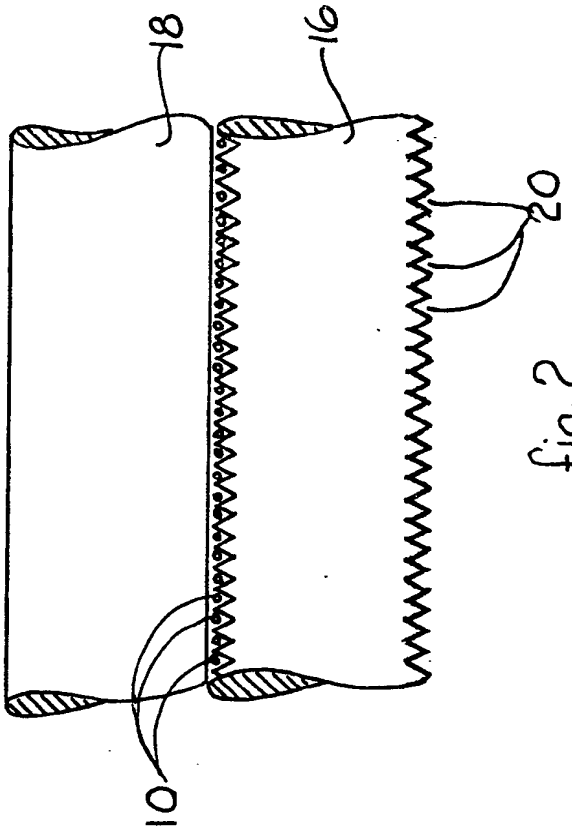

fig. 2.

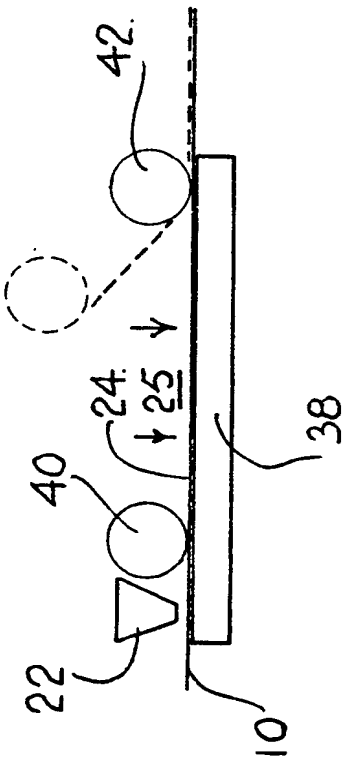

fig. 3.

SPECIFICATION

Web Formation

This invention relates to the formation of a coherent web of fibrous strands.

Textile fabrics having a coating, e.g. of cured resin system, to give them added body or stability have been proposed. For example certain upholstery fabrics may be back-coated with a polyurethane system on their reverse face. While it is a relatively simple matter to apply such a coating to a fabric it has hitherto not been possible to apply successfully such a coating to, for instance, an array of slivers or yarns since the problems of obtaining a coherent web while at the same time preventing the coating material striking through to the face of the fabric, and thereby spoiling the aesthetic effect, have not been overcome.

The invention seeks to provide a simple apparatus for forming a coherent web of fibrous strands such as textile yarns using a coating of resin material.

According to the present invention there is provided an apparatus which comprises a support member for an array of fibrous strands having a series of parallel grooves, means for holding the fibrous strands in the grooves, and means for supplying coating material to the fibrous strands in the grooves, the grooves being dimensional and spaced such that the coating material coats only one side of the array of fibrous strands.

The invention also provides a method of forming a coherent web of fibrous strands which comprises feeding fibrous strands side by side into the nip of a roller and a support member having a series of parallel grooves in its surface such that the strands are aligned by the grooves, and applying coating material to the nip so that the strands are fixed in the aligned state.

The fibrous strands are preferably textile yarns but other strands, such as rovings, slubbing or slivers may be employed. Ideally the yarns are spun yarns of staple fibres but continous filament yarns may also be used. Because the end-use of the product is primarily decorative the yarns used may be coloured and/or fancy yarns. The yarns may be of any textile fibre, but pleasing appearance is obtained with woollen-spun yarns of wool or staple acrylic fibres, particularly 'berber' type yarns.

The support member may be a grooved roller, or may be any other suitable support means, such as grooved support bed. The means for holding the fibrous strands in the grooves is preferably a nip roller.

The means for supplying coating material is advantageously a container or trough with an adjustable outlet so that the quality of material may be metered on the array of strands. However if the coating material is supplied in the form of a sheet, the supply means could conveniently be a roller or rollers geared to the strand speed.

The strands may be passed through the apparatus by suitable driving means, e.g. driven nip rollers or a driven web take-up roller.

The grooves on the support member, e.g. one of the nip rollers, serve to align the yarns so that they are fixed to each other accurately straight and parallel. Ideally each groove will accommodate one strand such as a yarn. The coating material may be supplied to the strands before the nip as a liquid or the material may be supplied as or on a separate sheet fed into the nip over the strands. However it is an advantage of the invention that a separate backing sheet is not necessary and in the preferred form a liquid coating material is used alone.

The coating material used will depend upon the desired end-use of the product. If it is desired to produce a relatively stiff, self-supporting web adhesives such as polystyrene emulsions of polyvinyl chloride latices may be used. For a more pliable product acrylate or synthetic rubber latices may be used. The coating material, or adhesive, may be self-curing or may have catalysts and/or cross-linking agents added prior to use. It may be heat curing (thermo-setting) or thermoplastic. In the latter case the adhesive may be supplied as a sheet of thermoplastic material which is softened immediately before or actually in the nip. Furthermore the adhesive may be applied to or carried on a backing sheet, e.g. a paper sheet. However it is an advantage of the invention that with appropriate selection of adhesive no backing sheet is required, and the web may be produced from the strands and adhesive alone. It is a further advantage of the invention that the grooves hold the strands accurately parallel and produce a uniform web without using expensive warp aligning equipment.

As indicated above, various means may be employed for introducing adhesive into the nip. However it is preferred to apply the adhesive directly to the strands and maintain an accumulation or reservoir of adhesive just in front of the nip to ensure there is adequate adhesive available to form a coherent web.

The use of the rollers in the invention ensures that enough pressure can be applied to the back of the fibrous strands to enable a coherent web to be produced, while the compression of the strands within the grooves prevents or reduces strike-through of the coating material to the upper face of the web.

Preferably the strands are fed into the nip rollers already substantially aligned, for example by passage through a comb or reed arrangement. Further once the web leaves the nip rollers it must be supported until the adhesive has set sufficiently to hold the strands.

If a heat-curing adhesive is employed, heat may be applied to the web in this zone while it is being supported. The support may comprise, for example, an endless conveyor or a series of idler rollers.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a schematic view of an apparatus according to the invention;

Figure 2 is a partial view on an enlarged scale of the nip rollers; and

Figure 3 is schematic view of another form of apparatus according to the invention.

Referring to figures 1 and 2 of the drawings, it can be seen that an array of woollen yarns 10 is fed from a creel or warp beam (not shown) through a pair of nip rollers 12 and a reed 14 to a further pair of driven nip rollers 16, 18. The rollers 12 are free running but have a braking device to tension the yarns 10. The bottom roller 16 is profiled with a series of parallel grooves 20, and the top roller 18 is plain. A trough 22 having an adjustable outlet feeds adhesive on to the yarns 10 above the roller 16. The web of yarns 24 leaving the rollers 16, 18 passes to a pair of similar rollers 26, 28, the upper being plain and the lower grooved as for roller 18. The grooves in the roller 26 are exactly aligned with the grooves 20 in roller 16, and the adhesive on the web is partly cured or allowed to cure by the agency of hot air blown on to the web in the zone 25 between the pair of rollers 16, 18 and 26, 28.

After leaving the rollers 26, 28 the web is supported on idler rollers 30 when further hot air may be directed at the adhesive coated surface to complete curing of the adhesive in the zone 31. Finally the web passes to a take-up roller (not shown) from which it may be removed for subsequent use.

As can be seen from figure 2, the yarns 10 are aligned by the grooves 20 of the bottom roller 16 while adhesive is applied. The yarns are accurately aligned by the grooves which are spaced and dimensioned so that the yarns substantially fill them and touch one another at the boundaries of adjacent grooves. The adhesive is therefore applied to one side only of the array and does not show through on the face.

We have found that direct or spreader application of adhesive is the most successful way to operate the method of the invention: application of adhesive via, e.g., a lick roller, does not provide sufficient adhesive adequately to fill the 'valleys' between adjacent yarns, and a coherent web is not produced. The outlet of the trough 22 is adjusted to maintain an accumulation or 'reservoir' of adhesive on the yarns 10 on top of the roller 16, which is then continuously spread over the whole sheet of yarns by the roller 18. The spacing or nip between the rollers 16 and 18 is adjustable to obtain the optimum clearance for any particular application. By this means, each yarn, and the valleys between the yarns, receive adequate adhesive to give an even, continuous coat.

The rollers 26, 28 are driven slightly faster than the rollers 16, 18 to maintain the yarns in the web 24 under tension and accurately aligned in the first curing zone. An adjustable stepping device is incorporated between the pairs of rollers.

If desired, a backing 32 may be inserted from a roll 34 at the nip of the rollers 26, 28 where it will laminate to the web 24. As previously stated, the web is by then already self-supporting and a backing will only be supplied where a particular end-use calls for it.

Figure 3 illustrates an embodiment of the invention in which the grooved rollers 16 and 26 are replaced by a grooved bed 38. A trough 22 supplies adhesive as before to an aligned array or sheet of yarns 10, and a roller 40 spreads the adhesive and coats the array to form a web 24. A second nip roller 42, equivalent to the roller 28 in the embodiment of figure 1 controls the web as it leaves the bed 38 on to idler rollers (not shown) through a second curing zone as before. The drive in this case is supplied by the take-up roller (not shown) which pulls the yarns 10 through the grooves in the bed. The rollers 40 and 42 are free to rotate and adjustable with respect to the bed.

The web produced by the method of the invention may be used for a wide variety of products, depending on the flexibility imparted by the choice of adhesive. These include wall-coverings, floor-coverings, lampshades, upholstery, soft shoe uppers, luggage, roller blinds, handbags, and the like. For a product in which increased strength across the width is desired, a backing sheet or fabric may be incorporated as described above.

The width of the apparatus is governed by the desired width of the web for a particular end-use. Similarly the number, spacing and depth of the grooves will depend largely on the types and properties of the yarns used. The viscosity of the adhesive or latex can be varied as required to suit conditions and yarn types employed. In a particular example, grooved rollers were employed with 9 grooves per inch each of 1/16" depth. 1's w.c. woollen yarns were passed through the apparatus (in the configuration of figure 1) and coated with latex, either a polyvinyl acetate or a styrene butadiene rubber containing an inert filler.

Claims

1. A method of forming a coherent web of fibrous strands which comprises feeding fibrous strands side by side into the nip of a roller and a support member having a series of parallel grooves in its surface such that the strands are aligned by the grooves, and applying a coating material to the nip so that the strands are fixed in the aligned state.

2. A method as claimed in claim 1 in which the fibrous strands are textile yarns.

3. A method as claimed in claim 2 in which the yarns are woollen-spun yarns of natural or synthetic fibres.

4. A method as claimed in any of claims 1 to 3 in which each groove accommodates one strand.

5. A method as claimed in any one of claims 1 to 4 in which the array of strands is directly supplied with coating material just before the nip.

6. A method as claimed in any of claims 1 to 5 in which the coating material is a settable liquid composition.

7. A method as claimed in claim 6 in which the composition is a polystyrene emulsion, a polyvinylchloride latex, an acrylate latex, a polyvinyl acetate latex or a styrene butadiene rubber latex.

8. A method as claimed in any of claims 1 to 7 in which the strands are aligned by passage through a reed before entering the nip.

9. A method as claimed in any of claims 1 to 8 in which a second nip similar to the first is spaced from the first and aligned therewith, the zone between the first and second nips being a first curing zone.

10. A method as claimed in any of claims 1 to 9 in which the nip or nips is or are formed by a plain roller and a grooved roller.

11. A method as claimed in any of claims 1 to 9 in which the nip or nips is or are formed by a plain roller and grooved support bed.

12. A method as claimed in any of claims 9 to 11 in which a backing sheet is laminated with the web at the second nip.

13. A method as claimed in any of claims 1 to 12 in which the web is supported for a time sufficient for the coating material to cure or be cured before being collected on a take-up roller.

14. A method of forming a coherent web of fibrous strands substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

15. A coherent web of fibrous strands aligned parallel and in contact held together by a coating material applied to one face only.

16. A web as claimed in claim 15 in which the fibrous strands are textile yarns.

17. A web as claimed in claim 16 in which the yarns are woollen spun wool or acrylic fibre yarns.

18. A web as claimed in any of claims 15 to 17 in which the coating material is cured polystyrene, polyvinylchloride, acrylate, polyvinylacetate of styrenebutadiene rubber.

19. A web as claimed in any of claims 15 to 18 additionally having a backing sheet laminated to the coating material.

20. A web whenever produced by a method according to any of claims 1 to 14.

21. An apparatus which comprises a support member for an array or fibrous strands having a series of parallel grooves, means for holding the fibrous strands in the grooves, and means for supplying coating material to the fibrous strands in the grooves, the grooves being dimensional and spaced such that the coating material coats only one side of the array of fibrous strands.

22. An apparatus as claimed in claim 21 in which the means for supplying coating compound comprises a container located adjacent the nip having an adjustable outlet.

23. An apparatus as claimed in either of claims 21 or 22 in which the support member is a grooved roller.

24. An apparatus as claimed in either of claims 21 or 22 in which the support member is a grooved support bed.

25. An apparatus as claimed in any of claims 21 to 24 in which the means for holding the fibrous strands in the grooves is a nip roller.

26. An apparatus as claimed in any of claims 21 to 25 in which a second support member is provided spaced from the first and aligned therewith, the zone between the first and second support members being provided with means to aid curing of the coating material.

27. An apparatus as claimed in claim 26 having a roll for providing a backing sheet to be fed with the array of strands on to the second support member.

28. An apparatus substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

New Claims or Amendments to Claims filed on 27 May 1980.
Superseded Claim 1.

New or Amended Claims:—

1. A method of forming a coherent web of fibrous strands which comprises feeding fibrous strands side by side into the nip of a roller and a support member having a series of parallel grooves in its surface such that the strands are aligned by the grooves, and applying a coating material to one side only of the array of strands so that the strands are fixed in the aligned state.

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